

Culex (Melanoconion) adamesi, a New Species
from Panama (Diptera, Culicidae)¹

Sunthorn Sirivanakarn² and Pedro Galindo³

ABSTRACT. The adults of both sexes, pupa and 4th stage larva of *Culex (Melanoconion) adamesi*, a new species from Panama are described and illustrated. Its affinity with *pedroi* Sirivanakarn and Belkin 1980, *crybda* Dyar 1924 and *epanastasis* Dyar 1921, as interpreted by Sirivanakarn and Belkin (1980) is discussed. The distribution, bionomics and medical importance are summarized.

INTRODUCTION

Following the isolations of Venezuelan encephalitis (VE) and several other arboviruses from wild caught adults of *Culex (Melanoconion) taeniopus* Dyar and Knab and related species at the Gorgas Memorial Laboratory (Galindo et al. 1966; Galindo and Srihongse 1967), several significant contributions have been made on the biosystematics of these species. Galindo (1969:82-9) recognized 7 different adult types and provisionally assigned 6 of these to the following nominal taxa: type A = *taeniopus* Dyar and Knab 1907; type B = *pseudotaeniopus* Galindo and Blanton 1954; type C = *spissipes* (Theobald 1903); type D = *vomerifer* Komp 1932; type E = *opisthopus* Komp 1926 (as *annulipes* (Theobald 1907)) and type F = *epanastasis* Dyar 1921. In addition, he also recognized another distinct adult form coded type G with an indication that it would be subsequently described. In the same paper, an attempt was made to reinterpret and resurrect *epanastasis* from the previous synonymy with *taeniopus* by Komp (1935:4). From correspondence with Alan Stone concerning the identity of the USNM types, the author proposed to synonymize *crybda* Dyar 1924 with *epanastasis*. The above Panamanian forms, including *cedecei* Stone and Hair 1968 (as a subspecies of *annulipes*, currently as *opisthopus* Komp based on the invalidation of *annulipes* by Belkin 1969:68) and 3 other extralimital taxa were provisionally placed in the *Culex spissipes* group. Almost all the adult forms identified with the above nominal taxa were recognized on the basis of the differences in the male genitalia described by Dyar (1928), Rozeboom and Komp (1950) and subsequent authors and to some extent also on certain conspicuous external features of the adults.

In recent years, further detailed taxonomic study of the medically important species was initiated by the senior author. As a result of this

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study, which was fully discussed in the preceding paper by Sirivanakarn and Belkin (1980), corrections were made in the interpretation of *taeniopus*, *epanastasis*, *crybda*, *opisthopus* and *pseudotaeniopus*, including also the description of *pedroi* Sirivanakarn and Belkin 1980 for the Panamanian populations previously known as *taeniopus*. Based on the above interpretations, the following corrections are made for the species recognized by Galindo (1969): type A = *pedroi*; type B = *epanastasis*; type E = *taeniopus* and type F = *crybda*. For the determination of the identity of these species, consult the provisional keys in Sirivanakarn and Belkin (loc. cit.). The complete descriptions and keys to all known stages of all species related to *taeniopus* will be published in a future revision of the group.

In order to make the name available for medical and ecological studies while this revision is in progress, we here recognize the Panamanian form coded type G by Galindo (1969) as new and describe all its known stages. As indicated in the preliminary review of the junior author and as confirmed here, this adult form is identical to type F and type A (*crybda* and *pedroi*, respectively) in the male genitalia but distinct from the latter 2 taxa in the following combination of characters: (1) absence of tarsal marking on the hindleg; (2) erect scales on the vertex of the head pale golden in the center, dark on the posterolateral areas and (3) abdominal tergites with broad basal transverse pale bands. In general, it occurs sympatrically with *crybda* and *pedroi*, but utilizes different habitats; the former 2 have been found in a rodent burrow and shallow pool adjacent to roots of trees and palms under heavy shade of swamp forest, whereas immatures of *adamesi* n. sp. (type G) were found in sunlit, open swamp, choked with floating sedges and grasses.

We take pleasure in dedicating the new species to Dr. Abdiel J. Adames, Chief, Department of Ecology, Gorgas Memorial Laboratory, Republic of Panama. The holotype will be deposited in the U. S. National Museum (USNM), Smithsonian Institution, Washington, D. C. The designated paratypes will be deposited in the mosquito collection of the Gorgas Memorial Laboratory (GML), Panama and sent to other institutions upon request.

Culex (Melanoconion) adamesi new species

(Figs. 1, 2, 3)

Culex (Melanoconion) type G of Galindo (1969:85)

FEMALE (Fig. 1). Wing: 3.13 mm. Proboscis: 1.8 mm. Forefemur: 1.44 mm. Abdomen: 2.16 mm. In general, medium or large sized for the subgenus; coloration dark brown or black. Head. Decumbent scales narrow, crescent shaped, entirely golden or yellowish, occupying a broad central area of vertex; broad appressed scales pale grayish or whitish, restricted to side of eyes, forming a distinct lateral patch; erect scales numerous, pale golden in center, contrasting sharply with dark ones on posterolateral areas; upper orbital setae strong and dark. Palpus and proboscis dark scaled. Palpus apparently 3 segmented, about 0.16 of proboscis length. Antenna slightly longer than proboscis, flagellum weakly plumose.

Cibarial Armature (Fig. 2). As figured and described for *pedroi* (Sirivanakarn and Belkin 1980); cibarial teeth 14, all flattened, columnar with hollow or transparent area restricted to bases of teeth, apical margin irregular; cibarial dome broadly oval, densely imbricate with numerous strong denticles. *Thorax*. Mesonotal integument brownish to blackish; scales narrow, predominantly brown on most parts of disc, pale golden, forming distinct streaks on anterior promontory, humerus, scutal angle, small golden spots on posterior fossa and antealar; scales on prescutellar space and scutellar lobes partially or largely pale golden. Integument of pronotum and pleuron same color as mesonotum. *Apn* with an even curved row of 12-15 setae on anterior lateral surface. *Ppn* with a patch of several narrow dark scales on upper surface and 5,6 posterior setae. Pleuron without distinct pattern of dark spots; *stp* with a distinct patch of broad pale scales on upper corner and a separate vertical scale patch along posterior border; upper *stp* setae about 9, moderately strong and more or less widely spaced; 1 lower *mep* seta, dark and strong. *Legs*. Femora without broad silvery white knee spots; tibiae and tarsi entirely dark scaled; pattern of white bands at joints of hindtarsomeres 1-5 absent. *Wing*. Scales entirely dark; scales on R_2 , R_3 and R_{4+5} broad, ovate. Halter knob largely pale scaled. *Abdomen*. Tergites II-VII with distinct basal transverse pale bands of variable width, continuous with broader basolateral pale spots laterad; sternites largely dark scaled. *Genitalia* (Fig. 2). As figured, not studied in detail.

MALE (Fig. 1). In general similar to female by having golden erect scales in the center of vertex of the head, pattern of golden scaled streaks or spots on the mesonotum, presence of a distinct scale patch on the upper corner of the sternopleuron, dark legs and presence of basal transverse pale bands on the abdominal tergites. *Head*. Palpus entirely dark, long, slender, exceeding proboscis by 1.5 of segment 5 to the combined length of segments 4 and 5; segment 3 with 5-7 strong setae on apex; segments 4 and 5 strongly plumose. Antenna slightly shorter than proboscis; flagellum strongly plumose.

MALE GENITALIA. As figured for *pedroi* by Sirivanakarn and Belkin (1980). *Segment VIII*. Median caudal margin shallowly or moderately emarginate. *Segment IX*. Lobe of IX tergite small, moundlike, bearing 10-12 weak setae. *Sidepiece*. Slender, conical about 0.29 mm in length; most outer tergal margin broadly convex, inner tergomesal margin concave; variable number of scales present near base on lateral tergal surface, latter also with several strong setae extending from near base to near apex; tergomesal margin with 1,2 irregular rows of about 10 short weak setae; tergal area laterad of tergomesal margin with 2 strong, long setae at about middle and several weak short setae extending beyond level of subapical lobe. *Subapical Lobe*. Essentially identical to *pedroi*. *Clasper*. Simple, about 0.5 of the length of sidepiece; distal portion gently curved at middle and tapered into a recurved truncate apex or snout; preapical portion usually with a distinct crest of fine spicules on outer margin; seta *a* distally inflated and apically truncate or broadly rounded; seta *b* rather strong, spinelike; seta *c* minute, rather inconspicuous. *Phallosome and Proctiger*. Essentially identical to *pedroi* (Sirivanakarn and Belkin 1980), differing from it by having 3,4 cercal setae.

PUPA (Fig. 2). Abdomen: 2.7 mm. Paddle: 0.65 mm. Trumpet: 0.61 mm. In general similar to *pedroi*, differing from it in the following combination of characters. Integument of cephalothorax, abdomen and paddle paler, yellow or yellowish white. *Cephalothorax*. Seta 3-C double; 4-C 4,5 branched; 5-C 6 branched; 7,9-C triple. *Trumpet*. Shorter and not sinuous in outline; distal portion uniform in width; pinna narrow, continuous with cleft or slit of meatus to a little over 0.5 of total length. *Abdomen*. Seta 5-V double or triple; 6-III-VI single except for 6-IV which is single on one side, double on the other; 9-VII single; 9-VIII double. *Paddle*. Broad, outer part pale whitish, inner part lightly pigmented; seta 2-P minute, double or triple.

LARVA (Fig. 3). Head: 0.84 mm. Siphon: 1.7 mm. Saddle; 0.36 mm. Similar to *pedroi*, differing from it particularly in the following features: *Thorax*. Seta 4-P double; 7-P 6,7 branched; 8-P 5 branched; 8-M 6 branched; 9-M 5 branched. *Abdomen*. Setae 1-III-VI 5-7 branched; 6-III 6 branched; 6-IV, V 5 branched; 6-VI longer than 6-III-V, triple. *Siphon*. Pigmentation uniformly yellowish white, median dark ring absent; subventral tufts 4.5 pairs (total 9), pairing irregular.

TYPE-DATA. *Holotype* ♀ (PA 798-10) with associated pupal and larval skins, Panama, *Canal Zone*, across canal from summit, "Empire Firing Range" (17PPA469009), 70 m, 18 November 1965, A. Quinonez and R. X. Schick (USNM #76340). *Paratypes*: 1 ♀ (PA 243); 2 ♂ (PA 246); 3 ♂ (PA 249); 1 ♀ (PA 249); 1 ♀ (PA 288); 3 ♀ (PA 322); 1 ♀ (PA 402); 1 ♀ (PA 663); 2 ♂ (PA 666); 1 ♀ (PA 666); 3 ♀ (PA 671), all from *Bocas del Toro*, Panama, April 1963-64, A. Quinonez, for detailed collection data, see material examined (USNM); 5 ♂ (CM 236- 109, 113, 114, 120), 5 ♀ (CM 236- 105, 107, 111, 115, 132), *Almirante*, Gorgas Memorial Laboratory (GML); 1 ♀ (OICS), *Darien*, Santa Fe, Gorgas Memorial Laboratory (GML).

DISTRIBUTION. Panama, Colombia, Ecuador, French Guiana and Brazil (Para). 84 specimens examined: 36 ♂, 48 ♀; 1 individual larval rearing.

PANAMA. *Bocas del Toro*: Chiriqui Grande, Mata de Cacao, 19-21 April 63, A. Quinonez; 1 ♀ (PA 243), 2 ♂ (PA 246). Punto de Pena, "Chiriquicito," 21 April 63, same collector; 3 ♂, 1 ♀ (PA 249). *Almirante*, Milla, 29 April-5-6 May 63, same collector; 1 ♀ (PA 288), 3 ♀ (PA 322); 13 April 64, same collector; 1 ♀ (PA 663). *Almirante*, camp, 14-15 April 64, same collector; 2 ♂, 1 ♀ (PA 666). *Almirante*, camp, 16 April 64, same collector; 3 ♀ (PA 671). *Almirante*, locality not specified, 1966, GML; 5 ♂, 5 ♀ (CM 236). *Darien*: Pucro, Rio Tacarcuna Valley, 19 June 63, A. Quinonez; 1 ♀ (PA 402). Locality not specified, 1966 ?, GML, 1 ♀ (OICS). *Canal Zone*: across canal from summit, "Empire Firing Range," 18 Nov 65, A. Quinonez; 1 1p♀ (PA 798; *holotype*).

COLOMBIA. *Santander*: Lebrija, 10 April 66, C. J. Marinkelle; 2 ♀ (COM 64A). *Caqueta*: Tres Equinas, 8 Aug 70, same collector; 2 ♀ (COM 494). *Boyaca*: Puerto Boyaca, 25 Nov 70, same collector; 5 ♀ (COM 496). *Meta*: Villavicencio, 15 July-15 Sept 71, same collector 1 ♀ (COM 506); 1 ♂ (COM 510); 1 ♀ (COM 517); 1 ♂ (COM 519); 1 ♀ (COM 521); 1 ♂, 1 ♀ (COM 526); 1 ♀ (COM 527); 2 ♀ (COM 529); 1 ♀ (COM 533); 1 ♀ (COM 534); 1 ♀ (COM 535); 1 ♂ (COM 539); 1 ♂ (COM 595); 2 ♀, 1 ♂ (COM 596); 1 ♀ (COM 600). Locality not specified: 5 ♀ (COK 42, 58, 62). For more complete data, consult

Heinemann and Belkin (1978c).

ECUADOR. Hdq. de Jesus, Quinonez, Quininde, ESM, 7-16-74, CDC collection; 1 ♂ (032177-7). San Rafael, Tenguel, Guayas, 5-16-74, CDC collection; 2 ♂ (041177-7, -10).

FRENCH GUIANA. Guyane: Cayenne, 1-2 Feb 65, T.H.G. Aitken, A. Guerra and R. Martinez; 1 ♀ (FG 26); same data except 3-4 Feb 65; 1 ♀ (FG 46). For more complete data, consult Heinemann and Belkin (1978b:398,400).

BRAZIL. Para: Belem, Reserva de Aura, 11 June - 25 Nov 70, T.H.G. Aitken and A. Toda; 1 ♂ (BRB 15); 2 ♂ (BRB 25); 1 ♂ (BRB 34); 2 ♂ (BRB 41); 2 ♂ (BRB 45); 15-25 Nov 65; 1 ♂ (BRB 58); 2 ♂ (BRB 62); 1 ♂ (BRB 63). Guana River Pump Station, 29-30 Sept 70; 1 ♂ (BRB 43); 1 ♂ (BRB 64). For more complete data, consult Heinemann and Belkin (1979).

TAXONOMIC DISCUSSION. On the basis of identical male genitalia, *adamesi* n. sp., *pedroi*, *crybda* and *epanastasis* evidently comprise a distinct complex of the *Culex spissipes* group. The adults of *adamesi* differ from *pedroi* and *epanastasis* in the absence of the broad silvery white knee spots on the apex of the femora and the absence of the pattern of white rings at the joints of hindtarsomeres 1 to 5 and from *crybda* in the partially pale golden erect scales of the head, the presence of golden scaled streaks and spots on the mesonotal disc and the presence of a small scale patch on the upper corner of the sternopleuron, whereas the reverse is true in the latter 3 species with which it was compared. The only known larva and pupa are from the holotype. They are similar to *pedroi* in most features of the chaetotaxy but are apparently distinct from the latter in the combination of the characters as given in the description.

In all stages, *adamesi* is closest to *crybda*. The pupa and larva of *adamesi* differ from those of *crybda* in the following features: in the pupa, the trumpet is darker, shorter and with broader distal portion; all setae stronger and more conspicuous; seta 5-IV 7 branched (3,4 branched in *crybda*); seta 9-VII single (2,3 branched in *crybda*) and seta 9-VIII double (triple in *crybda*). In the larva, it differs from *crybda* by having a narrower siphon, setae 1-III-IV 6,7 branched (4,5 branched in *crybda*), seta 6-III 6 branched (5 branched in *crybda*) and seta 6-V 5 branched (usually 4 branched in *crybda*). These morphological differences together with the differences in the larval habitat, the sympatric occurrence with its close relatives as noted by Galindo (1969) and the wide distribution reported here strongly indicate that *adamesi* represents a distinct taxon in a complex of the *Culex spissipes* group.

BIONOMICS. Little is known about the ecology of *adamesi*. Galindo (1969) found it as common as other related species in the lowland swamp forest where immatures were found in sunlit, open swamp choked with floating sedges and grasses. As reported for the other 6 Panamanian forms by this author, adults preferred the blood of rodents, but also fed on other mammals and birds, both in the forest canopy and on the ground. In the collection (PA 798) by the Mosquitoes of Middle America (MOMA) project,

a female (coded as *Cx. (Mel.)* sp. 39) was reared from a larva collected in a small ground pool in forest in association with immatures of *Cx. (Cux.) nigripalpus* Theobald, *Cx. (Mel.) elevator* Dyar and Knab and another undetermined *Cx. (Mel.)* sp. 34 (Heinemann and Belkin 1978a:157). This site contained grassy vegetation; the bottom was covered with plant debris and the water was temporary, clear, stagnant and fresh. All adults from the MOMA collections in Panama (PA 243, 249, 288, 322, 402, 663, 666, 671) were collected from light traps in secondary growth in swampy areas.

MEDICAL IMPORTANCE. The role of *adamesi* as a natural reservoir or vector of arbovirus is not established. However, from the results of virus isolation studies (Galindo et al. 1966), it seems possible that the pools of *crybda* specimens from which Bussuquara virus and Guama-group virus were isolated might have also contained *adamesi*.

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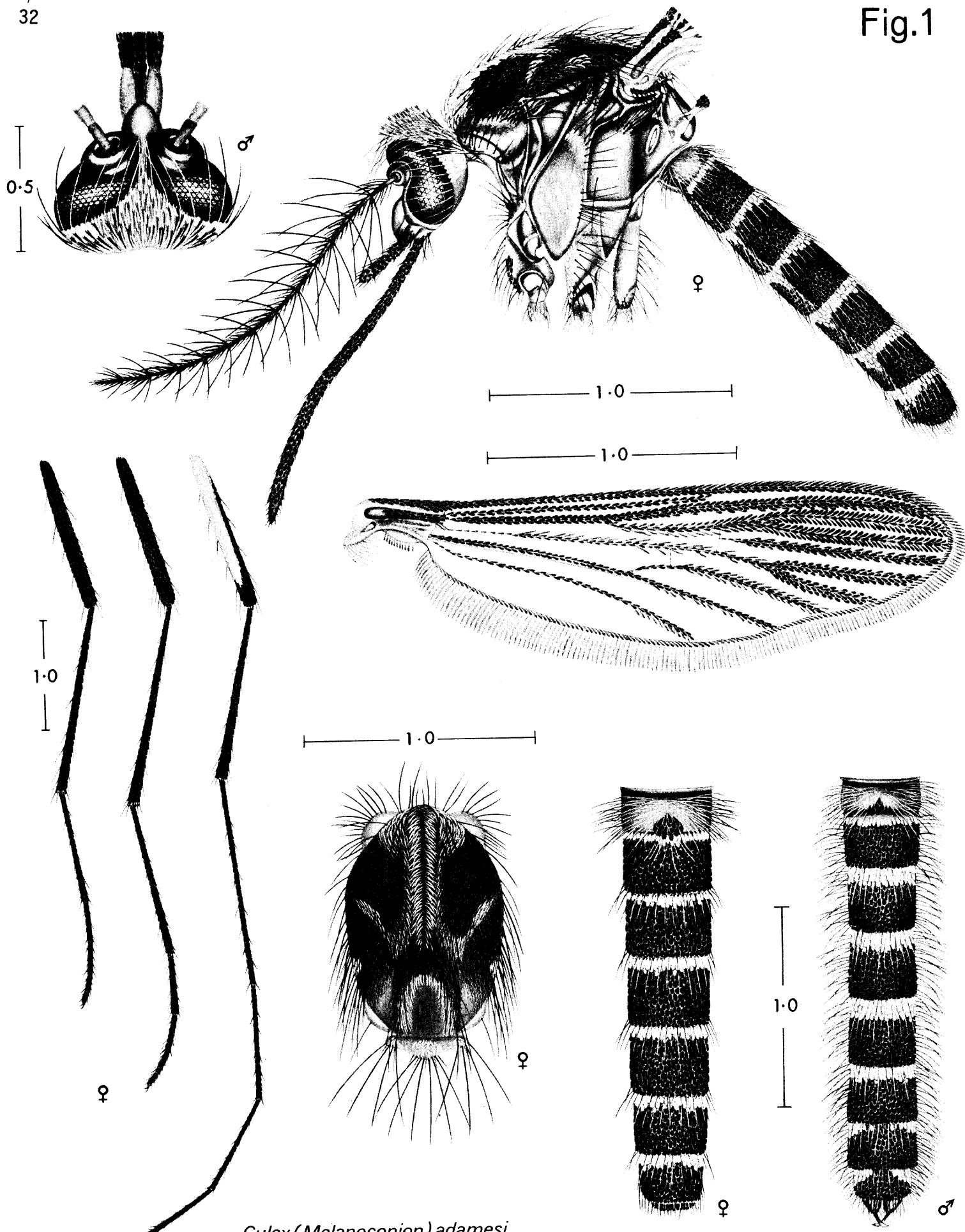
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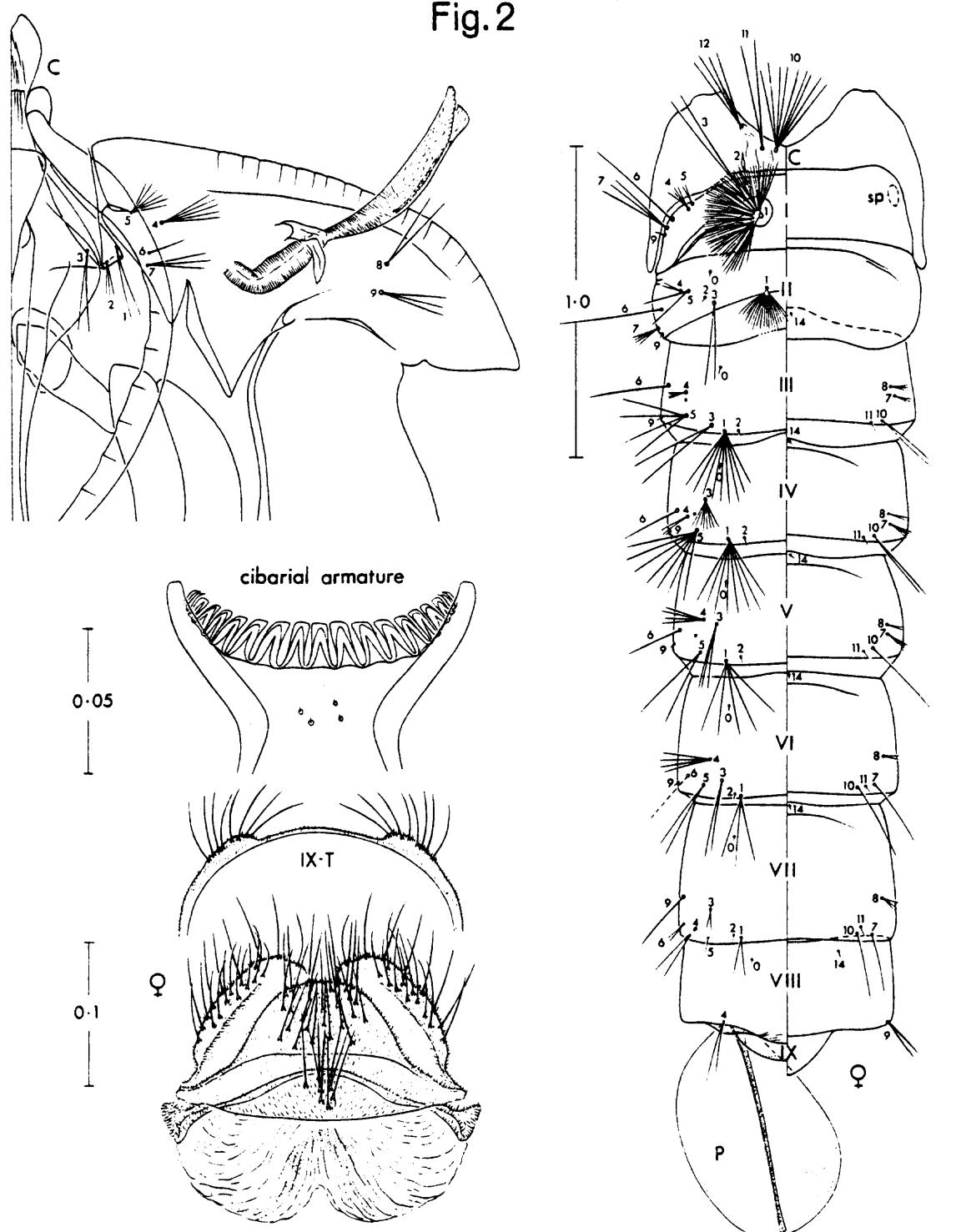
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Culex (Melanoconion) adamesi
Canal Zone
PANAMA

Richai Malikul

Fig. 2



Culex (Melanoconion) adamesi
Canal Zone
PANAMA

Sohai Malakul

Fig. 3

